FONDAZIONE BRUNO KESSLER
MAGAZINE

Quantum computing is closer than we first thought

April 4, 2018

The transistor happened because of the research and development made for the hearing aid that spawned the computing industry as we know it. So we talked about supercomputers with Jacob Biamonte (Skoltech), trying to see what could the "hearing aid" of quantum computing be and we found out that the impact of this technology will surely be "shocking" and "irreversible".

Jacob Biamonte is an American physicist, quantum computer scientist and Associate Professor at the Skolkovo Institute of Science and Technology and Head of Skoltech's "Deep Quantum Labs". Biamonte has made several contributions to the theory and implementation of quantum computers. We had the chance to meet him during Skoltech's visit to FBK, so we asked him some questions, starting from the **state of the art of quantum computing**:

On the one hand, we have dedicated quantum simulators and those are devices where you basically try to think of something that you want to understand, and then you build that same thing and then you make a measurement to understand it: it's called a quantum wind tunnel. Then you have different levels of programmability, different levels of precision and control. The highly precise precision and control devices are coming from IBM, these are around 50 qubits. The highly programmable devices which are some form of simulators, well.. they are coming from D-Wave Systems, those around 2000 spins and are called "annealers".

What's the relationship between quantum computing and big data?

A lot of people want to understand what is the relationship between big data, computation, quantum computation, how does it all fit together, and it's actually interesting. First you don't know where innovation is going to come from. ***The transistor happened because they got research development to make the hearing aid*** *and that spawn the computing industry. Quantum big data is very big data. A*

quantum state is very difficult to understand and study because of the fact that it is a quantum mechanical state and in principle it can take many different degrees of freedom to describe that state. Now, in terms of using a quantum computer to solve data analysis problems, there's many different quantum subroutines that can work in tandem with a classical computer.

What could be the impact of this technology?
The interesting thing about quantum computers right now is: you always hear IBM has 50 qubits, Rigetti has 19 qubits, D-Wave has 2000 spins in the annealing quantum system. Soon we are going to start hearing more and more about how these qubits are being used to solve practical questions. And the impact, where it does happen, it's irreversible, it's unchangeable. We won't be able to ever go back to the point that we are today. ***The types of things that these machines will open up will be like a new form of electricity****, or it's what the laser is to the lightbulb. It's something really different. These quantum machines can be viewed in some way as a black box, and I think it is a profound model of computation where now the classical computer programmers are able to access these machines and I think that the impact of that, in the short term, will be very shocking and in the long term will be very profound. Our data analysis centres will start to be filled with, at first, kind of a programmable quantum wind tunnel and then eventually a general-purpose quantum computer.*

Will we have once a portable quantum computer?
One of the things about trying to imagine the future, is that it's very hard because the future is unknown. And the interesting thing is that your time right now, and what you say right now correlates to the future, so you can change the future by talking about it. This is like Cassandra, the legend, she knows the future but she can't tell anyone. Anyway so there's all these famous quotes from people in the early days of computing saying someday computers are going to weigh less than a ton.
Well, there's a company in Canada called Xanadu, a couple of my friends work there, and they're trying to build a room temperature potentially portable quantum computer. At first, of course right now, these quantum computers they have to be cooled down to a very very low temperature. To have a portable one… I don't know if we need one right away, but in the long term I think companies like Xanadu are gonna look at different applications of quantum technology, they'll do it at room temperature and this will lead to more portable electronics that incorporates different aspects of quantum effects. ***So we're probably closer to that then we first thought****.*

PERMALINK

https://magazine.fbk.eu/en/news/quantum-computing-is-closer-than-we-first-thought/

TAGS

- #computing
- #Quantum Technologies

RELATED VIDEOS

- https://www.youtube.com/watch?v=seVLyRwdTko

AUTHORS

- Alessandro Girardi